High Speed Integrated Optical Switch, Phase I

Completed Technology Project (2018 - 2019)

Project Introduction

The goal of this program is to develop high performance, high speed, integrated optical switches for applications requiring the switching of four lasers into one PM fiber. These switches will be of small size and weight given that they will be fabricated as a Photonic Integrated Circuit (PIC) and will be designed to meet the following target specifications:

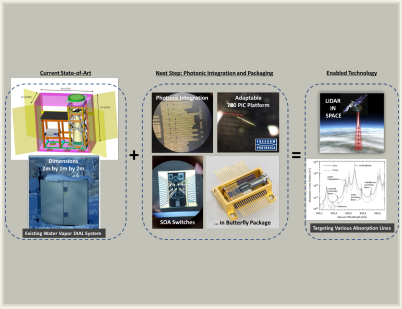
- Four input channels and one output channel
- Cross-talk between channels better than 30 dB
- Net optical gain through switch
- Switching speed <1 µs
- Switching rate of ~1-3 kHz

The optical switch will be based on Semiconductor Optical Amplifiers (SOAs) and a passive combiner. The SOA has in previous demonstrations been proven to meet the target speed, gain and contrast requirements of this effort.

Anticipated Benefits

NASA applications include instruments for accurate measurements of atmospheric water vapor using the differential absorption lidar (DIAL) technique which continue to be developed by NASA toward a sensor that would be suitable for autonomous, long-term measurements of water-vapor in a national scale network. Sensing of water vapor is a primary application target. Methane is a secondary target, while other atmospheric gases are of potential interest in the extension.

Switched LIDAR systems are being developed by other government agencies including the Air Force. Dual use applications exists in emerging atomic sensing systems, in particular the need for development of compact integrated switches to support emerging miniaturized Alkali cold-atom sensing systems in the 600-800nm range. Commercial applications include optical communications where fast dynamic switching increasingly become a key enabler for dynamic optical networks.



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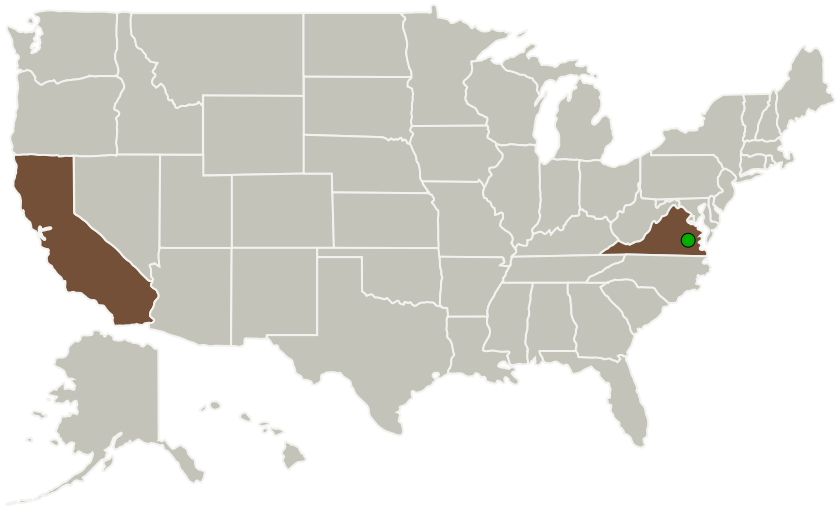
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Freedom Photonics, LLC	Lead Organization	Industry	Santa Barbara, California
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Transitions

July 2018: Project Start

February 2019: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/141084)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Freedom Photonics, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

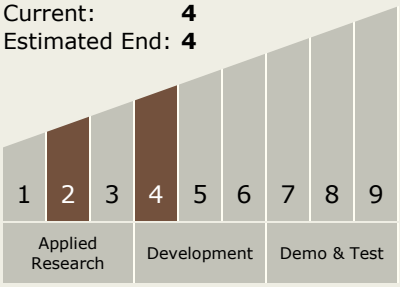
Carlos Torrez

Principal Investigator:

Leif Johansson

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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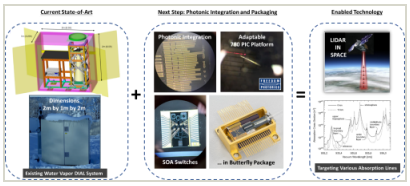
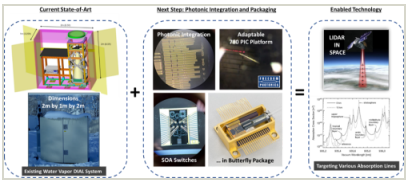
Images



Briefing Chart Image
High Speed Integrated Optical Switch, Phase I
(https://techport.nasa.gov/image/132469)



Final Summary Chart Image
High Speed Integrated Optical Switch, Phase I
(https://techport.nasa.gov/image/126882)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers

Target Destinations

Earth, The Moon, Mars